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THERMOLUMINESCENCE PROPERTIES OF EU DOPED BAM PHOSPHOR

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Abstract: Bam Phosphors are good for use in lamps and displays but degradation and afterglow are a matter of concern. Many Researchers in India have done tremendous work in this field to obtained new phosphors. Developed in India are LIF, Dy, NaCl, Ca, LaPO4, Tb, NaCl, Tb, LiYF4 : U4+ CaSO4 : dY.LaPO4 : Ce and Quluminates in mono, dia and tri-valent doped forms. In present study the TL properties of f BaMgAl10O17 doped with impurities Eu has been examined in order to investigate the effect of impurities on TL – behavior of BaMg-alluminate and to find out the peak suitable for TL dosimetric application. One prominent peak was found after ϒ irradiation. The effect of different doses have been examined under identical experimental conditions. It is found that TL intensity increases linearly with increase in gamma dose(.1-1000Gy).

INTRODUCTION

The present tend is to use The BAM in Plasma Display Panels and Fluorescent and compact Eluorescent lamps is increasing constantly. The BaMgAl10O17 normally called BAM, is the present widely used lamp Phosphor. Thermoluminescence (TL) is one of the important techniques in the field of Luminescence and its applications, Many researchers have done lot of work in this field to establish TLD phosphor. The main phosphors developed in India are NaCl : Ca, CaSO4:Dy,LaPO4:Ce,Lif:X and aluminates in mono-di and tri valent dopant variants this is an attempt to examine the TL-behavior of the present prepared phosphor.

By Considering the advanced technology in phosphor materials the BAM is selected with various rare-earth activators for their commercial applications in view of their high spectral power of distribution of specific fine with excellent efficiency. The rare-earths are costly but have provided stability to phosphors in the stringent operating conditions of the devices. Because of the demand for rare-earth phosphors for television, X-ray excited materials and fluorescent lamps, the physical chemistry and availability of various fluxes for preparation and purification of these compounds has been improved greatly, providing consistent and reliable materials in purify levels required for efficient phosphor absorption and emission.

EXPERIMENTAL

The specimens of BaMgAl10O17 doped with various concentrations of Eu have been prepared by standard solid state reaction. The appropriate oxides were normaly ground and fired at 1200°C for four hours. Then the mainting phosphor cake was ground to a find powder using mortal and pestle. A uniform heating rate of 6.66 C°/sec was used in the present work for all the samples three output the range of 25-400°C/S equal aliquots (5 mg) of these samples were then subjected to irradiation with gamma radiation source. TL dosimeter studies are based on the Eu doped BAM with gamma doses from .1 to 103 Rad. The TSL curves for these irradiated samples were recorded immediately after irradiation and also. TL was measured after regular intervals (stored in a dark peaks)

RESULTS AND DISCUSSION

The phosphors were exposed to γ–dose .1 to 103 Gy. The man glow peaks exhibits by the phosphrs are around 180 and 330°C. It is interesting to note the effect of single dipent displays a good TL peaks having a proprieties internity and Temperatures. The over all TL peaks observed is interesting. It is known fact that the glow curve shape and peaks temperatures of a given BAM aluminates are different depending on the impurities and quality introduced in the host material.

Since the phosphor has to be coated in the CFL and the same is used as dosimeter. Its other dosimetric characteristic are also examined carefully. The position of glow peak is at 180 and 330°C indicating that the electron traps involved are deep enough and high energy in required to release The Trapped electrons, hence long strange of trapped charge carriers at normal working temperature is achieved and thus the thermal stability is ensured Fig.–1 shows the γ–irradiated TL decay of 180 peak after storage at room temperature for 18 days.

The effect of different γ–doses on TL glow curve of the phosphor shown in Fig.–2 that with increase in γ–dose. The nature of the glow curves and peaks positions remain unaffected. It can be seen in Figure 2 that the dose response in linear over a wide range of .1 – 1000 Gy. This satisfies another important requirement for the phosphor to be a TL dosimetric material. The routine monitoring of radiation doses is normally carried out after a time interval ranging from 1 week to 3 months. It was therefore pertinent to study the fading characteristics of the 180 and 330°C peak on storage for different periods. This aspect was examined carefully and the descrease in the intensity of the dosimetry peak as a function of post irradiation intervals. Since the operating temperature of fluorescent lamp is around 45°C, the fading effect of the present phosphor is studies at room temperature around 25°C. It may be seen that the peak intensity decreases by 12% over a period of 3 weeks. Normally, such significant loss of time is allowed for measurement of the absorbed dose in accidential dosimetry. The observed fading is, therefore, within the experimental limits for the specific application discussed in the present case. In addition to the various characteristics examined as described above the low cost of the phosphor material, non-hygroscopic nature and its other physical characteristics are beneficial for its twin use as lamp phosphor and as a dosimetric material.

The peak parameters are calculated using the peak shape method. The activation energy and frequency factor of Eu dopped BaMgAl10O17 phosphors are 1.14 eV and 9.02 x 1011 Sec–1 for 180°C peak while 2.0 eV and 1.6 x 1016Sec–1 for 330°C peak. Kinetic order of peak 180°C is 0.42 (1st Order) and probability per second of electron from trap is 0.342 Sec–1. It is believed that the TL peak around 180°C in Eu dopped BaMg-aluminates is isolated, well defined and intense one, therefore it may be useful in TL-dosimetry.

CONCLUSION

In this study we used in BAM dopped Eu as a potential phosphor in accidental radiation dosimetry. The results are very promising and found to be valuable for its use in blue CFL as phosphor as well as in dosemeter.

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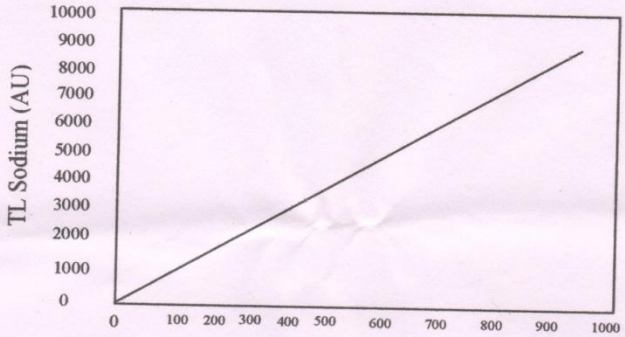

Fig. 2 Growth of Peaks

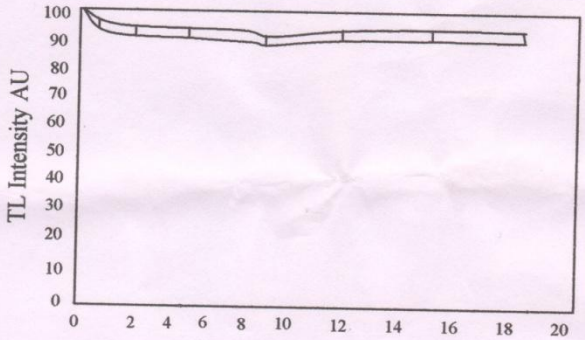

Fig. 1 Decay of peaks